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# Pesticide Fact Sheet Number 53: Metribuzin

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This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

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EPA

# Pesticide Fact Sheet

Name of Chemical: METRIBUZIN
Reason for Issuance:
Date Issued: June 30, 1985
Fact Sheet Number: 53

## 1. Description of the Chemical

Generic name: 4-amino-6(1,1-dimethylethyl)-3-(methylthio)-1, 2,4-triazin-5(4H)

Empirical formula: $C_8H_{14}N_4OS$

Common name: Metribuzin

Trade name: Sencor, Lexone

Chemical Abstracts Service (CAS) Registry Number: 21097-64-9

Office of Pesticide Program's EPA Chemical Code Number: 101101

Year of Initial Registration: 1973

Pesticide Type: Herbicide

Chemical Family: S-triazine

U.S. Producer: Mobay Chemical Corporation

## 2. Use Patterns and Formulations

Application sites:

Metribuzin is registered for control of broadleaf weeds and grasses in soybeans, potatoes, barley, winter wheat, dormant established and sainfoin fields, asparagus, sugarcane, tomatoes, lentils, peas, and non-cropland.

Type of formulation:

Metribuzin is available as a 50 percent formulation intermediate, 94 percent technical for formulation into end-use products, wettable powder, flowable concentrate and dry flowable concentrate.

Types and methods of application:

Metribuzin may be soil incorporated, surface applied or applied foliarly, broadcast or band with ground equipment. It can be applied by aerial equipment or sprinkler irrigation (potatoes).

Application Rates:

0.25 to 4.0 ai/A on crop sites,
6.0 to 8.0 ai/A on railroad rights-of-way.

Usual Carrier:

Water

3. Science Findings (Rationale for Regulatory Position)

Summary Science Statement:

Metribuzin is not acutely toxic by oral, dermal, inhalation, or eye irritation routes of exposure. The available data do not indicate that any of the risk criteria listed in 162.11(a) of Title 40 of the U.S. Code of Federal Regulations have been met or exceeded for the uses of metribuzin at the present time. Data gaps include rat chronic study, teratology study, multigeneration reproduction study and two categories of mutagenicity testing. There are also extensive residue chemistry data gaps.

Metribuzin has been found in Ohio rivers and Iowa wells. Although there are extensive data gaps in the area of environmental fate, available data indicate that metribuzin has a potential to contaminate ground water in soils lower in organic matter and clay content.

Available data indicate that metribuzin is moderately toxic to upland bird species on an acute oral basis, no more than slightly toxic to birds in the diet, moderately toxic to freshwater fish and invertebrates. Metribuzin is slightly toxic to shrimp. A detailed ecological hazard assessment cannot be made until the acute dietary study on an upland gamebird, acute toxicity studies on a marine/estuarine fish species and an oyster species, and appropriate environmental fate data are fulfilled.

Chemical Characteristics:

Metribuzin is a solid at room temperature. Its molecular weight is 214.28. The melting point is 125.5 to 126.5 °C. Metribuzin is soluble in aromatic and chlorinated hydrocarbon solvents, and in water (at 20 °C) to 1220 ppm.

Toxicological Characteristics:

Acute toxicity effects of metribuzin are as follows:

Acute Oral Toxicity in rats: 2200 mg/kg body weight for males; 2345 mg/kg body weight for females, Toxicity Category III.

Acute Dermal Toxicity in rats: 20,000 mg/kg body weight, Toxicity Category IV.

Acute Inhalation $LC_{50}$-rat: > 20 mg/L/1 hour, Toxicity Category IV.

Skin Irritation in rabbits: PIS = 0.33/8.0, Toxicity Category IV.

Eye Irritation in rabbits: Not an irritant, Toxicity Category IV.

Dermal Sensitization in guinea pig: Not a sensitizer, Toxicity Category IV.

Subchronic and Chronic Effects:

The 2-year dog study indicated dogs dosed with 1500 ppm (37.5 mg/kg) had reduced weight gain, increased mortality, hematological changes and liver and kidney damage. The no-effect level is 100 ppm. The oncogenic potential of metribuzin is unclear at this time. The mouse oncogenicity study is negative for oncogenic effects. The chronic rat study indicates a statistically significant ($p < 0.05$) increase in the incidence of adenoma of liver bile duct and pituitary gland in females at the 300 ppm dose level. Additional histopathology and historical control data on the incidence of these tumors in this particular strain of rats are needed before it can be determined if the increase is compound related. A teratology study in rabbits indicated no evidence of teratogenic effects at 135 mg/kg/day, the highest dose tested (HDT) and a NOEL of 15 mg/kg/day for maternal and fetal toxicity. Data gaps include rat chronic study, rat teratology study and multigeneration reproduction study.

Mutagenic Effects:

Available data indicate that metribuzin is not mutagenic. Data gaps exist in two categories of mutagenicity testing, specifically gene mutation studies in mammalian cells and tests for primary DNA damage such as sister chromatid exchange or unscheduled DNA synthesis assay.

N-Nitroso Contaminants:

Available data do not provide grounds for concern at this time. The data are incomplete. The analysis for N-nitroso contaminants is requested.

Major Routes of Human Exposure:

Primary nondietary exposure to the farmer is expected to be dermal and to occur during mixing, loading, and application. Exposure through ocular, inhalation and ingestion routes are also expected.

PHYSIOLOGICAL AND BIOCHEMICAL BEHAVIOR CHARACTERISTICS:

Adsorption Characteristics:

Metribuzin is absorbed through the leaves from surface treatment, but the major and significant route for uptake is via the root system.

Translocation Characteristics:

Uptake through the roots is best described as osmotic diffusion. Metribuzin is translocated upward in the xylem and moves distally when applied at the base of the leaves. It concentrates in the roots, stems, and leaves.

Mechanism of Pesticidal Action:

Photosynthesis inhibitor.

Metabolism in Plants:

The major routes of detoxification are the action of oxidation and conversion to water soluble conjugated products.

ENVIRONMENTAL CHARACTERISTICS:

Adsorption and Leaching in Basic Soil Types:

Metribuzin is moderately adsorbed on soils with high clay and/or organic matter content. Metribuzin is readily leached in sandy soils low in organic matter content.

Microbial breakdown:

Microbial breakdown appears to be the major mechanism by which metribuzin is lost from soils. Breakdown occurs fastest under aerobic conditions and at comparatively high temperatures.

Loss from photodecomposition and/or volatilization:

Slight loss.

Average persistence at recommended rates:

Half-life varies with soil type and climatic conditions. Half-life of metribuzin at normal use rates is 1 to 2 months.

Potential Ground Water Problem:

Metribuzin has been found in Ohio rivers and Iowa wells. Available data show that metribuzin has a potential to contaminate ground water in soils low in organic and clay content. The Agency is requesting water monitoring studies on metribuzin and has determined that all uses of metribuzin should be classified for "restricted use" with appropriate labeling including a ground water advisory statement.

Ecological Characteristics:

Avian Acute Oral Toxicity: 169.22 mg/kg (moderately toxic).

Subacute Dietary Toxicity: > 4000 ppm for mallard duck and bobwhite quail (slightly toxic).

Acute Toxicity on Freshwater Invertebrate: 4.18 ppm (moderately toxic).

Acute Toxicity on Fish: 76.78 ppm for rainbow trout (slightly toxic), 75.96 ppm for bluegill sunfish (slightly toxic).

96-Hour $LC_{50}$ on a Marine/Estuarine Shrimp: 48.3 mg/l (slightly toxic).

Potential Problem for Endangered Species:

The Agency evaluated metribuzin under the cluster/use pattern approach for use on corn, soybeans, and small grains. Available data indicate that metribuzin use on crops would probably not affect Federally listed animal species.

Consultation with Office of Endangered Species (OES) on use of sulfometuron methyl indicated several species of endangered plants which occur on or adjacent to rights-of-way would be jeopardized by exposure from its use. The Agency has concluded that these plants would be jeopardized by exposure to metribuzin. The Agency is imposing a statement concerning endangered plant species on all end-use products containing metribuzin and labeled for use on rights-of-way.

Tolerance Assessment:

The Acceptable Daily Intake (ADI) is based on a no-observable effect level of 100 ppm (2.5 mg/kg) from the 2-year dog study. Using a 100-fold safety factor the ADI is 0.025 mg/kg/day with a Maximum Permissible Intake (MPI) of 1.5 mg/kg for a 60 kg adult human. Theoretical maximum residue contribution (TMRC) for metribuzin based on established tolerances is 0.3508 mg/day for a 1.5 kg diet. Currently, the permanent tolerances utilize 23.39 percent of the ADI.

The Agency is unable to complete a full tolerance reassessment because the available metribuzin toxicology and residue data do not fully support the established tolerances listed below. The metabolism of metribuzin in animals is not fully understood. Therefore, the Agency is requiring data on metabolism of metribuzin and related metabolites in ruminants, poultry, and several crops. The additional data will be used to assess dietary exposure to metribuzin and may lead to revisions in the existing tolerances.

| Commodities | Parts Per Million |
|---|---|
| Alfalfa, green | 2.0 |
| Alfalfa, hay | 7.0 |
| Asparagus | 0.05 |
| Barley, grain | 0.75 |
| Barley, straw | 1.0 |
| Cattle, fat | 0.7 |
| Cattle, mbyp | 0.7 |
| Cattle, meat | 0.7 |
| Corn, fodder | 0.1 |
| Corn, forage | 0.1 |
| Corn, fresh (inc sweet K + CWHR) | 0.05 |
| Corn, grain (inc popcorn) | 0.05 |
| Eggs | 0.01 |
| Goats, fat | 0.7 |
| Goats, mbyp | 0.7 |
| Goats, meat | 0.7 |
| Grass | 2.0 |
| Grass, hay | 7.0 |
| Hogs, fat | 0.7 |
| Hogs, mbyp | 0.7 |
| Hogs, meat | 0.7 |
| Horses, fat | 0.7 |
| Horses, mbyp | 0.7 |
| Horses, meat | 0.7 |
| Lentils (dried) | 0.05 |
| Lentils, forage | 0.5 |
| Lentils, vine hay | 0.05 |
| Milk | 0.05 |

| Commodities | Parts Per Million |
|---|---|
| Peas | 0.1 |
| Peas (dried) | 0.05 |
| Peas, forage | 0.5 |
| Peas, vine hay | 0.05 |
| Potatoes | 0.6 |
| Poultry, fat | 0.7 |
| Poultry, mbyp | 0.7 |
| Poultry, meat | 0.7 |
| Sainfoin | 2.0 |
| Sainfoin, hay | 7.0 |
| Sheep, fat | 0.7 |
| Sheep, mbyp | 0.7 |
| Sheep, meat | 0.7 |
| Soybeans | 0.1 |
| Soybeans, forage | 4.0 |
| Soybeans, hay | 4.0 |
| Sugarcane | 0.1 |
| Tomatoes | 0.1 |
| Wheat, forage | 2.0 |
| Wheat, grain | 0.75 |
| Wheat, straw | 1.0 |

| Food | Parts Per Million |
|---|---|
| Barley, milled fractions (except flour) | 3.0 |
| Potatoes, processed (inc potato chips) | 3.0 |
| Sugarcane molasses | 2.0 |
| Wheat, milled fractions (except flour) | 3.0 |

| Feed | Parts Per Million |
|---|---|
| Barley, milled fractions (except flour) | 3.0 |
| Potato waste, processed (dried) | 3.0 |
| Sugarcane bagasse | 0.5 |
| Sugarcane molasses | 0.3 |
| Tomato pomace, dried | 2.0 |
| Wheat, milled fractions (except flour) | 3.0 |

International Tolerances - Canada

| Commodities | Parts Per Million |
|---|---|
| Asparagus | 0.1 |
| Barley grain | 0.1 |
| Lentils | 0.1 |
| Peas | 0.1 |
| Potatoes | 0.1 |
| Soybeans | 0.1 |
| Tomatoes | 0.1 |
| Wheat grain | 0.1 |

Although the above Canadian tolerances differ from those in the United States, it is inappropriate for the Agency to harmonize these tolerances at the present time because of extensive toxicology and residue chemistry data gaps.

There are no tolerances for residues of metribuzin in Mexico or Codex Alimentarius.

Problems Known to Have Occurred With Use:

The Pesticide Incident Monitoring System (PIMS) does not indicate any incident involving agricultural uses of metribuzin.

4. Summary of Regulatory Position

Based on the review and evaluation of all available data and other relevant information on metribuzin, the Agency has made the following determinations.

The available data do not indicate that any of the risk criteria listed in 162.11(a) of Title 40 of the U.S. Code of Federal Regulations have been met or exceeded for the uses of metribuzin at the present time.

The Agency will not allow any significant new uses to be established for metribuzin until the toxicology and residue chemistry deficiencies identified have been satisfied.

The Agency is requesting data on presence of nitroso-contaminants in metribuzin. Available data do not provide grounds for concern at this time.

Based on concern for ground water contamination, the Agency has determined that all uses of metribuzin should be classified as restricted use and carry appropriate labeling including a ground water advisory statement.

The agency is concerned about the exposure of endangered/ threatened plant species occurring on or asjacent to rights-of-way from the use of metribuzin. An Endangered Species statement is being required on the labeling.

The Agency is imposing a rotatonal crop restriction. The extent of this restriction will be reconsidered when additional data are recieved.

Specific Label Precautionary Statements:

Hazard Information:

The Human Precautionary Statements must appear on all MP labels as precribed in 40 CFR 162.10.

Environmental Hazards Statements:

All manufacturing-use products (MP's) intended for formulation into end-use products (EP's) must bear the following statements:

> Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or public water unless this product is specifically indentified and addressed in an NPDES permit. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of EPA.

All end-use products with outdoor uses must bear the following statement.

> Do not apply directly to water or wetlands. Do not contaminate water by cleaning of equipmet or disposal of waste.

Ground Water Statement:

All end-use products (EP's) must be classified as "RESTRICTED USE" (Refer to 40 CFR 162.10(j)(2)(B)) and the labels must bear the following ground water advisory.

> Metribuzin is a chemical which can travel (seep or leach )though soil and can contaminate ground water which may be used as drinking water. metribuzin has been found in ground water as result of agricultural use. Users are advised not to apply metribuzin where the water table (ground water) is close to the surface and where

soils are very permeable; i.e., well drained soils such as loamy sands. Your local agricultural agencies can provide further information on the type of soil in your area and the location of ground water.

Endangered Species:

Notice: The use of this product on rights-of-way may pose a hazard to certain Federally designated endangered plant species. They are known to be found in specific areas within the locations noted below. Prior to making applications, the user of this product must determine that no such species are located in or immediately adjacent to the area to be treated. For information on protected species contact the Endangered Species Specialist of the appropriate Regional Office of the U.S. Fish and Wildlife Service listed below:

Region 1-Portland, Oregon
California counties of Contra Costa, Solano, San Diego, Santa Barbara, Ventura, Los Angeles and Orange.
Idaho, Idaho County.
Oregon, Harney County.
Region 2-Albuquerque, New Mexico
Arizona counties of Coconino and Navajo.
New Mexico counties of San Juan, Otero, Chaves, Lincoln, Eddy and Dona Ana.
Texas counties of El Paso, Pecos and Runnels.
Region 3-Twin Cities, Minnesota
Iowa counties of Allamakee, Clayton, and Jackson.
Region 4-Atlanta, Georgia
Florida counties of Clay, Gulf, Gadsden, Franklin and Liberty.
Georgia counties of Wayne and Brantley.
North Carolina, Henderson County.
South Carolina, Greenville County.
Region 5-Newton Corner, Massachusetts
New York, Ulster County.
Region 6-Denver, Colorado
Utah counties of Emery, Piute, Garfield, Washington, Utah and Wayne.
Colorado counties of Montezuma, Delta and Montrose.

Restrictions on Rotational Crops

Do not plant food and feed crops other than those which are registered for use on metribuzin treated soils.